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USSR Report

CONSTRUCTION AND RELATED INDUSTRIES



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USSR REPORT
CONSTRUCTION AND RELATED INDUSTRIES

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CONSTRUCTION PLANNING AND ECONOMICS

ROLE OF CREDIT IN UNFINISHED CONSTRUCTION EXPENDITURES

Moscow FINANSY SSSR in Russian No 4, Apr 86 pp 38-42

[Article by USSR Stroybank [Bank for Financing Capital Investments] Chardzhou Office Manager K. Rozykulyyev under the rubric "Capital Investment and Banking and Financial Control": "The Role of Credit in Expenses for Unfinished Construction and Installation Work"]

[Text] The introduction of a procedure of subcontractor organization settlements with clients for commercial construction output has led to a growth in the investment of working capital for unfinished construction. This makes necessary an increase in the efficiency of the monitoring of the course of construction, and first and foremost start-up facilities, by banking institutions.

Questions of credit for unfinished construction of facilities under construction in violation of time periods acquire especial topicality. For the subcontractor organizations under the monitoring of the Chardzhou Oblast office of USSR Stroybank, the share of expenditures for overdue facilities currently totals approximately one fifth of the total amount of unfinished construction, and even more for some construction ministries (Turkmen SSR Minstroy [Ministry of Construction], Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] and Mintransstroy [Ministry of Transport Construction]). As a result, remainders of unfinished construction form beyond the plan and the cost of facilities under construction is increased. This confirms the necessity of strengthening economic methods of influencing a reduction of construction times, and first and foremost through credit for expenditures on unfinished production.

The Communist Party has posed the task of increasing the efficacy of the influence of credit controls on the observance of the climate of economizing, the mobilization of internal economic resources and the elimination of non-productive expenses and losses. In order to resolve this task, the institutions of Stroybank conducted certain work, especially in the sphere of making the influence of credit on unfinished construction more active and making it a basic link in the system of measures for bank monitoring of the start-up program.

All types of economic and engineering work of the bank at all stages of monitoring--preliminary, current and follow-up--should promote the fulfillment

of the start-up program in the established time periods with the least expenditures. It is important that the organizational methods of influence be reinforced by the influence of credit controls. The broad possibilities of this influence on the financial-management activity of contract organizations is explained by the high share of credit in the formation of unfinished construction of service organizations.

In 1979, USSR Minfin [Ministry of Finance], USSR Stroybank and USSR Gosbank [State Bank] published a position on the procedure for utilizing the funds freed up among clients, with regard to the transition to accounts without intermediate payments, as resources for issuing credit to contract, planning and surveying organizations to cover expenditures for unfinished construction, installation, planning and surveying work. The transition to settlements between the client and the contractor for the completeness of finished enterprises, start-up complexes, phases and facilities turned over for operation, ready for the output of products or the rendering of services, according to the estimated cost of commercial construction output completed by the construction organizations and clients of our oblast was completed in 1981. The issuance of contract advances to contractor organizations for expenditures for unfinished construction and installation work was halted.

New credit relationships arose and began to be developed between the bank and the construction-and-installation contractor organizations with the ending of the issuance of contract advances. Currently the expenditures of the latter for incomplete construction up to the planned turnover time of completed construction of the enterprises are covered through credit. Bank employees, according to documents presented by the contractor organizations (estimate, application, list etc.) determine the amount of credit due. The standard for internal working capital for expenditures for unfinished construction are taken into account in this as a source to cover expenditures for this purpose.

The bank's purposeful economic control makes it possible to discover, in the process of financing unfinished construction, expenditures by enterprise (facility) and work complex for which construction is halted, not included in the plan, without planning-estimate documentation, and not accepted for financing, as well as expenses associated with the overfulfillment of the construction plan for those facilities for which it is forbidden. Credit for expenditures for unfinished construction for facilities not accepted by the bank for financing should be especially noted. All expenditures for unfinished production for the construction of enterprises (facilities) and work complexes carried forward are met with credit by the bank in the new calendar year, regardless of reports of their acceptance for financing, since it will have been obtained in the previous economic year. Furthermore, a grace period was established for financing. After the approval of the state plan of economic and social development, the banking institutions review capital investment by individual facility submitted by the ministries, departments and ispolkoms of the local soviets of people's deputies.

A number of facilities are not accepted for financing by the banks. The reasons are: the lack of capital investment within the limits of the standards for the duration of construction and of organizational construction and installation capacity, the absence of equipment etc. Nonetheless, the

expenditures of contractor organizations for unfinished construction receive credit. The institutions of Stroybank, upon receiving a report of the non-acceptance of a facility for financing, issue a ruling for the recovery of a total amount of credit corresponding to the absolute value of the expenditures for unfinished construction from special loan account No 313 (expenditures for facilities for which the turnover times have not arrived) and direct them to account No 391 (overdue loans of contractor organizations). In this manner, the turnover in the overdue loan account is artificially increased.

A trend of growth in the number of facilities under construction at the same time has been discovered. The proportion of indebtedness for facilities not turned over on time, including in the Gaz-Achak, Neftezavodsk, Gaurdak and other divisions of the bank, grew considerably in 1983 and 1984 in the total amount of loans for the three accounts used for credit for unfinished production.

The study of currently existing credit practice for unfinished construction testifies to the fact that the bank has many reserves for strengthening the monitoring of the start-up program, especially over the course of the construction of facilities with overdue times for placement in operation. Instances of the slow surmounting of lags for such facilities call attention to themselves. Analysis of contractor-organization data shows that in the year following the violation of facility turnover times, the introduction of only individual facilities, and not all overdue ones, is envisaged. In the Turkmenvostokneftstroy [Turkmen Eastern Petroleum Facility Construction], Chardzhoustroy [Chardzhou Construction] and Gaurdakkhimstroy [Gaurdak Chemical Facility Construction] construction and installation trusts, for example, the limit of construction and installation work was planned in 1984 at the levels of 87, 38.9 and 21 percent respectively of the remainder of estimated cost of operations for the beginning of the year for facilities not placed in operation earlier, and the amount of commercial construction output at 0.05, 37 and 27.7 percent. There is an analogous situation at the Naipgazstroy [Naip Gas Facility Construction] Trust. As a result, the construction of a considerable portion of such facilities in the year following the disruption of the start-up just continues or is not envisaged at all. Apart from that, the amount of work established according to the indicated indicators is frequently not fulfilled. All of this leads in the end result to the repeated carry-forward of facility turnover times.

This situation is confirmed by an analysis of the frequency and amount of credit for expenditures on unfinished construction from loan accounts opened for this purpose in the oblast institutions of Stroybank: No 313--for facilities, not yet due for turnover; No 316--for facilities with overdue turnover times, in the amount of expenditures made to the expiration of the term; and, No 317--for facilities with overdue turnover times for expenditures made after the expiration of the term. The following data (see table) testify to the dynamics of indebtedness according to bank loans made for expenditures for unfinished construction for 40 contractor organizations of Chardzhou Oblast.

Год	Всего	(3) В ТОВ ЧИСЛЕ ЗАТРАТ В %			
		(1)	(2)	(4) Обороты, сроки когда которых не наступили (счет № 313)	(5) Обороты с про- сроченными сроками ни санки в обеих затрат, осущес- твленных до кон- чения срока (счет № 316)
1982	100	89,2		9,5	1,3
1983	100	82,7		12,4	4,9
1984	100	84,2		13,8	2,0
(7) Итого	100	85,1		12,1	2,8

Key: 1--Year; 2--total; 3--including expenses for: 4--facilities not yet due for turnover (account No 313); 5--facilities past due for turnover, in the amount of expenditures made up to the expiration of the time periods (No 316); 6--facilities past due for turnover, for expenditures made after the expiration of the time periods (No 317); 7--total.

An analysis conducted over 1981-84 on four construction and installation trusts (Chardzhoustroy, Turkmenvostokneftstroy, Gaurdakkhimstroy and Naipgazstroy), with an aggregate total of 58 construction sites with turnover time violations for which loan indebtedness is already figured according to No 317 at the beginning of each year. It is important to note that indebtedness by loan calculated for Nos 316 and 317 at these trusts is increasing rapidly from year to year. Its proportion for No 316 at the Gaurdakkhimstroy Trust totaled 32 percent of total loan indebtedness, and for Naipgazstroy it was 80 percent. This testifies to the fact that the construction and installation trusts cited are not fulfilling the planned targets for the placement of enterprises (facilities) and start-up complexes into operation.

The data of the economic analysis confirm that almost all contractors have a low level of indebtedness for account No 317--from 1 to 2 percent of the total loan amount for unfinished construction. Thus, for the majority of organizations the proportion of credit issued through account No 317 is less than 15 percent of the total loan indebtedness for the three accounts (Nos 313, 316 and 317) calculated for 1981. No changes occurred in the loan indebtedness for account No 317 over the observation period.

Large indebtedness in account No 316 arose over 1981-84--at a level of from 10 to 63 percent of total indebtedness--in the Chardzhoustroy, Turkmenvostokneftstroy, Gaurdakkhimstroy and Naipgazstroy trusts. Thus, the principal amount of indebtedness for unfinished production for facilities not turned over on time was attributed to account No 316, which testifies to the slow "advance" toward start-up of the facilities not turned over earlier. Analysis showed that the indebtedness of contractor organizations through special loan account No 313 is growing systematically. This indicated the rapid growth of expenditures for unfinished production in construction and installation work.

Production practice of many years testifies to the fact that the procedure for interest surcharges for loans for unfinished construction do not have the required influence on accelerating production work at the facilities that were not turned over on time. Currently, interest for the use of credit for both account No 313 and account No 316 is collected at a 0.5-percent rate, which has a weak economic influence of the financial aspect of the activity of

contractor organizations. That is why it seems expedient to review the question of reinstating the procedure that existed earlier of collecting increased interest for credit from the whole total of unfinished production of overdue facilities, and not just from that portion that is figured after the arrival of the planned start-up time. Additional preconditions for this are created thanks to the one-third increase in the standard for planned accumulation with regard to estimated prices introduced in 1984 for construction and installation work.

The necessity has arisen to strengthen other measures for credit influence on accelerating the introduction of start-up complexes as well. The initial turnover times are now discounted by banking institutions for the charging of increased interest for credit. All other controlling organizations (superior to the contractor organization, planning, statistical), as well as client organizations, proceed from the times established for overdue facilities for the planned year. Even the organs of Gosarbitrash [State Board of Arbitration] do not institute proceedings for such facilities on their own initiative. This is a drag on the course of construction of start-up complexes and other facilities.

In order to strengthen monitoring and the responsibility of contractor organizations and clients for the most rapid completion of facilities not turned over on time, it makes sense, in our opinion, to introduce changes in the system of construction planning indicators so as to approve limits by individual construction site for each plan year for the construction and installation work and the amounts of commercial construction output for enterprises, start-up complexes and facilities not turned over by the initial times. The incorporation of this proposal would permit an increase in the role of credit planning, as well as the fuller utilization of the principle of the dedicated-plan area of credit. In the credit planning process for unfinished production today, expenditures for facilities not turned over on time are taken into account in the credit application only at the beginning of the year and subsequent quarters. At the same time, the limits of construction and installation work and the planned amounts of commercial construction output for overdue facilities is not envisaged.

The planned total of credit for expenditures for start-up facilities in the upcoming year not turned over for operation for this or that reason is correspondingly not calculated, and this means at this stage of planning there is no strict monitoring of the conclusion of their construction. That is why it seems necessary to compose individual individual calculations of the need for credit and to allocate independent limits for credit for unfinished construction for expenditures carried out by contractor organizations before the initial facility turnover times and after their expiration. When the times for the introduction of other facilities are not observed over the course of the year, additional credit limits for this purpose should be allocated with the careful basing of requirements and real guarantees for the most rapid completion of construction. This is also one of the most efficient ways of transferring the loan fund of Stroybank.

It makes sense to tighten the credit procedure for unfinished construction for facilities not turned over on time. By analogy with the practice of issuing

credit for commercial and material values that are unnecessary or beyond the plan, it is expedient to conclude credit agreements for the continuation of credit for expenditures for facilities whose turnover times have been violated. The conditions for issuing credit for the formation of the standard working capital for unfinished construction should be changed in order to strengthen bank control over the formation of sources of expenditures for overdue facilities.

According to established procedure, the credit granted is the chief source for meeting the expenditures for unfinished construction for all facilities for which the turnover times have still not yet arrived or are already overdue. Credit is granted on average for 15 days in the form of an advance from the loan account designated for accounting for credit before planned enterprise and facility turnover times on the scale of the planned amount of work executed by internal resources with the collection of 0.5 percent annual interest. At the same time, contract organizations with a high proportion of work on facilities that were not turned over on time are illegally utilizing low-interest credit for covering the expenditures of unfinished production for overdue facilities. Credit, therefore, should make the rate of construction more active. It can fulfill this function only when higher interest rates are charged for its utilization. A technique should be developed, it seems, for these organizations for the issue of credit for the formation of the standard based on the ratio of work on facilities whose turnover times have not arrived and those that have already passed. Under these conditions, the necessity of planning and actually accounting for the amount of construction and installation work and commercial construction output for facilities not turned over in the initial periods is obvious.

It is essential to keep in mind the inexact nature of issuing credit according to operational data, which does not always reflect the actual scale of coverage for each of the loan accounts. This is associated with the difficulties of determining, in the short time allotted for the composition of operational information, the amount of work fulfilled over the preceding period from the moment of the last adjustment at facilities with past and ongoing time periods, the amounts of commercial construction output handed over to clients, the documents for which can still not be drawn up by the adjustment date and creditor indebtedness to subcontractor organizations relating to the three types of credit expenditures and of non-credit expenditures.

The difficulties are intensified for subcontractor organizations which carry out work at a multitude of complexes. Correct data can be determined only according to the balance sheet of the principal activity. According to Stroybank instructions, however, it is not permitted to utilize additional surpluses discovered (compared to operational data) in the auditing of the balance sheet for coverage for one of the loan accounts (for credit for the expenditures of unfinished construction) for the purpose of eliminating shortfalls in other accounts for these expenditures. In our opinion, such a opportunity should be presented when the "credit" is produced only within the limits of additionally discovered shortfalls and, naturally, new loans for

other purposes are not issued in the auditing of the balance sheet. Then unfounded turnover in the overdue loan fund will be able to be avoided, insofar as real coverage exists for the indebtedness.

It must be noted that Point 26 of the fourth paragraph of USSR Stroybank Instruction No 3, "Contractor Organization Credit," was supplemented with text with the following content: "In determining the total amount of unsecured indebtedness for the banking institution, it is essential to proceed from the fact that shortfalls in coverage discovered in the aggregate for the three types of loan accounts relate to unsecured indebtedness for loans for unfinished production." The example of auditing the credit coverage for expenditures for unfinished production according to the balance sheet, however, is unchanged (see p 13 of Instruction No 2). Banking institutions, in the development and composition of statistical reporting on the results of auditing indebtedness of short-term loans for expenditures for unfinished production, determine the size of unsecured debt for these loans. This comes from the fact that unsecured debt in the loans mentioned relates to shortfalls in coverage discovered for the three loan accounts in the aggregate (Nos 313, 316 and 317). Therefore, in our opinion, the example of auditing credit coverage for expenditures for unfinished production according to the balance sheet should be altered.

With regard to the introduction of a new type of credit (credit for expenditures for unfinished production), contractor organizations extremely rarely used credit (since higher interest was charged) for the payment of wages to employees. Currently, they pay wages basically through credit for expenditures for unfinished production. In this regard, contractor organizations have preferential treatment, insofar as the credit cited for facilities with past and on-going introduction periods are charged 0.5 percent a year, and credit for the payment of wages is 3 percent annually. In our opinion, it would be expedient to charge 3 percent a year for the total amount of credit directed toward the payment of wages through credit for unfinished construction.

A differentiated approach, it seems, is needed here. For example, if the introduction of start-up facilities into operation is fulfilled, it makes sense to charge no more than 0.5 percent for credit, and 3 percent for non-fulfillment. It would be appropriate, after the payment of wages through credit for expenditures of unfinished construction, to consider an absolute amount of credit for these expenditures in a separate account (having in mind lagging behind the plan of the construction organization, the plan of work production, the calendar plan etc.).

Aside from bank credit, the credit indebtedness of subcontractor organizations is a source of working capital for incomplete construction for facilities not turned over on time. By the way, in the bank audit of the loan coverage for incomplete production, all credit indebtedness, including for overdue facilities, is considered a source for covering the expenditures of facilities whose turnover times have not arrived. That is why, in avoiding the incorrect determination of the scale of coverage for various loan accounts, it is expedient to change the information form for credit expenditures for unfinished production so that all types of coverage, non-credit expenditures

and sources, including the indebtedness of subcontractor organizations related to expenditures credited for each of the loan accounts, is reflected in detail in it.

It is important to note another detail. Frequently accounts for fulfilling the work of subcontractor organizations at facilities not turned over on time are paid from the general contractor's loan account, intended for credit for facilities whose turnover times have not arrived, and not from the accounts for credit for expenditures with past times. In this regard, the obligation should be imposed upon all subcontractor organizations of reflecting in their accounting documents data on the type of facility or start-up complex on which work is being conducted. In cases where a distortion of the data is established in auditing, it would be expedient to grant the bank the right to charge a fine.

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CONSTRUCTION PLANNING AND ECONOMICS

IMPROVING ORGANIZATION, FINANCING OF DESIGN WORK

Moscow FINANSY SSSR in Russian No 4, Apr 86 pp 42-44

[Article by senior engineer A. R. Alaverdov of USSR Gosstroy [State Committee for Construction Affairs] Planning Institute No 2: "Some Questions in Improving the Organization and Financing of Design Work"]

[Text] The strategic line of the party of accelerating social and economic development, drawn up at the April (1985) Plenum of the CPSU Central Committee, dictates the necessity of qualitative advances in economics on the basis of intensification and growth in the efficiency of production. The re-equipping of all sectors of the national economy utilizing the modern achievements of science and technology presupposes the concentration of capital investment in the priority areas of the national economy and improving matters in capital construction. It is precisely from these points of view that the possibilities of better assimilating capital investment, sharply reducing the amount of incomplete facilities and not allowing an increase in construction cost are being studied, which is especially important under the conditions of the mass transition to new technological systems. One way of solving the given problem is increasing the efficiency of planning estimates [proektno-smetnoye delo].

As noted in the report of Comrade M. S. Gorbachev at the June (1985) conference of the CPSU Central Committee, inefficient technological solutions are already incorporated into plans, due to which many of them are returned for reworking. The transfer of the economy to the intensive growth path and the utmost increase of production efficiency requires an improvement in the quality of planning output, first of all through improving its technical level and incorporating the latest achievements of science and technology in them. The organization of the pre-planning stage or pre-planning study has a great influence on the final results of planning. We will discuss this in more detail.

The working design is preceded by the pre-planning stage. Commercial output is not created immediately at this stage, and only the preconditions of its formation are formulated: the orders received for planning and surveying work (PIR) are analyzed and elaborated, along with time periods, cost estimates and the basic technical and economic parameters of the facility; the choice of construction sites is formulated; the construction targets are composed and approved; and, initial data are collected.

The qualitative parameters of planning depend on these operations. Thus, an economically and technically based selection of construction sites produces a significant saving of material and financial resources during construction; the qualified composition of planning targets permits the rational planning and organization of the production process, which substantially reduces the time periods for plan development. Finally, the reliability and completeness of the initial data collected before the beginning of manufacturing planning provides the planner with primary information and creates the preconditions for the adoption of highly efficient planning solutions. In its turn, the violation of the established process for conducting the pre-planning stage has a negative effect not only on the working-design process, but on the efficiency of capital investment overall: initial data obtained in incomplete amounts lengthens the fulfillment of PIR for the given facility, increasing its cost; the irrational selection of construction sites, implemented on the basis of low-quality engineering and geological surveying, requires additional material, labor and financial resources during construction, and in certain cases can lead to the premature reconstruction of the facility right after completion.

An important factor in improving the quality of pre-planning work is increasing the efficiency of the system for financing it. Instructions of USSR Stroybank [Bank for Financing Capital Investments] on financing planning and surveying work clearly regulate the opening of financing for specific work (planning, theme, etc.) by the presence of a formal contract between the planning and surveying organization (PIO) and the client. In practice, several months pass from the moment of arrival of the order for the fulfillment of work to the formulation of a contract, in the course of which the most qualified specialists and planners are occupied with preparing the facility for the working design. The given operations, therefore, are not financed and are fulfilled in the form of an advance. Often, for various reasons (the transfer of work to a different organization, the elimination of the facility from the title list, etc.) the contract is not formulated and the PIO expenditures for the fulfillment of pre-planning work are correspondingly not reimbursed. The organization then bears direct losses.

In accordance with the existing procedure, the two most labor-intensive types of work in the pre-planning stage--the composition of planning assignments and the collection of initial data--are executed by the manpower of the client. It is assumed that the staff members of the planning organization take part only in the selection of the construction site and consult with the client on questions of composing the plan targets for planning and the collection of initial data. It is precisely this amount of work that is envisaged by the existing system of financing.

The client organization, as a rule, however, does not have specialists at its disposal who can manage the assignment in a qualified manner. As a result, instead of technical consultation the planning organizations provide for the collection of practically all of the initial data with their own manpower and develop the plan for planning assignments. In this manner, the amount of work executed by the planning organization in the pre-planning stage increases to 70-75 percent compared to the regulation, and correspondingly financed, amount.

The only way that allows the planning organizations to cover partially the expenses for preparing the facility for planning is the conclusion of an agreement with the client at the expense of its basic activity funds for the rendering of technical assistance in the collection of initial data. The formulation of this agreement with a supplemental schedule and estimate allows the management of the planning organization to include the collection of initial data as a fully entitled operation, that is, covered by current financing, in the departmental production plans. In 1985, the enterprise standard (STP) "Procedure for Planning and Organizing Operations for the Preparation of a Facility for Planning" was placed in experimental operation at the PI-2 [Planning Institute 2] of USSR Gosstroy, which envisages, with the availability of such an opportunity, the obligatory conclusion of an agreement with the client on the rendering of technical assistance at the expense of his basic activity. At the end of 1985, such an agreement was concluded for 8,500 rubles for the planning of facilities, and three more agreements are in the formulation stage.

Such agreements, however, are currently rarely concluded, which is explained by the following reasons. First, only work on the collection of initial data is subject to inclusion in the agreement and, correspondingly, payment. As concerns the selection of sites and the composition of the assignment plan, they, notwithstanding their considerable labor intensity, are not financed from the client's basic activity funds.

Second, the agreement on the rendering of technical assistance at the expense of the basic activity funds can include only cost-accounting organizations on independent balance sheets. At the same time, the principal body of orders for the PIO is from ministries and departments financing planning and surveying work only through centralized capital investment. In practice, even under the most favorable conditions for the PIO with the aid of the basic-activity funds of the client, no more than 15-17 percent of the total amount of work on preparing the facility for planning can be financed. All of this has a negative effect both on the system of planning and operational-production regulation within PIO and on the qualitative indicators of its output, which is impermissible under the conditions of growing demands on the technical level of planning-estimate documentation.

Insofar as the pre-planning study is neither covered by current financing, nor possesses an independent estimated cost, its inclusion in departmental production plans is a complicated problem. The given work is usually not incorporated in the plan, or is included in it conditionally, which immediately gives it a secondary character compared to other operations covered by financing.

Under the conditions of extremely tight capacity at the majority of planning organizations, the management and specialists of production departments have a vested interest in the shortest times for executing the minimum essential amount of pre-planning work on a specific facility, so as to return to the immediate working design of facilities on which the fulfillment of the production plan, with all of the economic and social consequences it entails, depends. As a result, the pre-planning study is far from completely fulfilled

and is of insufficiently high quality, which has a negative effect on the technical and economic indicators of planning output and, in the end result, on the output of capital construction overall.

It should be noted that poor pre-planning study lowers the quality of preparation documentation for the reconstruction and technical re-equipping of existing productive capacity--the chief area of development of modern capital construction. It is precisely at the pre-planning stage that the real possibility exists for ensuring a significant economic saving. With full and objective information at their disposal on the facility under reconstruction, the planners obtain the opportunity to utilize solutions in the plan that decrease the requirements for material, labor and financial resources and reduce the time period for the given facility to reach planned capacity.

Taking into account what has been stated, it would be expedient, in our opinion, to stipulate in the documents that regulate the financial activity of the PIO that pre-planning study is an integral part of the planning and surveying work for any facility. It should be executed by the specialists of planning organizations and fully paid for by the client through centralized capital investment with the corresponding inclusion of the given type of work in the limits of the planning organization.

Pre-planning study is often fulfilled by PIO specialists at the stage when there exists a probability that the given facility will be removed from the title list or transferred to another organization. They can therefore formulate individual agreements, concluded with the client before the beginning of execution, and according to an independent schedule and estimate. It is recommended that the requirement be disseminated in pre-planning study that is obligatory for the other types of PIR--work cannot be accepted for production that is not covered by current financing. Its estimated cost should be determined in accordance with the actual labor expenditures necessary and ensure the planned level of profitability.

A limit for the cost of pre-planning study should be established as a percentage of the estimated cost of the plan overall. This limit differs depending on the specific conditions of planning and construction (reconstruction, technical re-equipping). As practice shows, the maximum cost of operations at the pre-planning stage should total 8-10 percent under usual conditions, 10-12 percent with the attachment of standardized plans and in the reconstruction of existing enterprises and up to 15 percent in the planning of facilities being built under extreme conditions (regions with increased seismic risk, East Siberia, the polar regions etc.).

With the aim of creating a real vested interest in the complete and high-quality execution of the full amount of the given types of work on the part of planning organizations, their cost should not be included in the total cost of the plan, as is currently done, but added on to it. The total amount of cost increase will be reimbursed to the national economy as a result of the implementation of measures directed toward increasing the technical level of plans, which leads to an economy of material and labor resources in construction, the acceleration of the facilities' reaching planned capacity, a

reduction in construction times and correspondingly of incomplete production, and a decline in the cost of production of enterprises being built and reconstructed.

The proposed procedure of financing pre-planning study will allow it, in our opinion, to occupy a rightful place in the series of other operations fulfilled by PIOs. This leads to the improvement of planning and strengthening of the monitoring of its execution. The essential economic preconditions will be created for a substantial improvement in the quality of planning-estimate documentation and an increase in the efficiency of planning.

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INDUSTRIAL CONSTRUCTION

NEW STANDARDS FOR INDUSTRIAL, AGRICULTURAL DESIGN, CONSTRUCTION

Dimensional Diagrams for Common Structures

UDC 721.013:725.4

Moscow PROMYSHLENNOYE STROITELSTVO in Russian No 3, Mar 86 pp 21-23

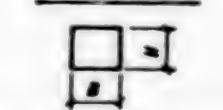
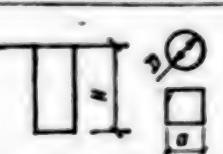
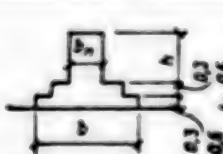
[Article by Candidate of Technical Sciences N.A. Ushakov (TsNIIpromzdanii, USSR Gosstroy): "Standardizing the Structures of Industrial Enterprises"]

[Text] Standardization is the basis of construction industrialization. It is especially important in structures which differ widely in intended purpose, types of components, component size, and load. The constant criticism of plants manufacturing prefabricated reinforced concrete components for numerous type-sizes of components to be manufactured relate foremost to structure components, making their standardization very important.

Integrated standardization of the common types of industrial enterprise structures is done by the TsNIIpromzdaniy [Central Scientific Research, Planning and Experimental Institute of Industrial Buildings and Structures], jointly with many other institutes. It has been doing this since 1962, with updates approximately every 10 years. The last review was done in 1982-1983.

The most important stage of standardization is the development of structure dimension diagrams which establish the basic sizes, parameters and loads which determine the choice of materials and components. Once the proposed dimension diagrams have been approved by the USSR Gosstroy's Glavorgprojekt [not further identified], they should be used in developing standard plans for industrial enterprise structures and standard components for them and in developing individual and experimental structure plans. Deviations are permissible when developing plans for renovating structures not built in conformity with the modular system or for renovating unique structures. The dimensional diagrams for the basic mass-produced structures are given in the table [following pages].

Underground Structures. The dimensional diagrams for retaining walls cover angular-section prefabricated reinforced concrete walls. The basic standardized dimension is the full height of the wall, the drop being assumed to be a multiple of 300 mm, depending on the depth of the foundation on the lower side.

(1) Споружение	(2) Схема споружения	(3) Размеры, м
(4) Подземные споружения		
Подпорные стены (5)		H_n H — 1.2—4.8 кратно 0.6 (6) 3.1—6.3 кратно 3.6 (7) —
Подвалы помещений производственного назначения (подвалы) (11)	 	H_0 L_0 B_0 От 3.0 далее кратно 0.6 (9) 3.0 далее кратно 1.5 (10) 6; 7.5 От 3.0 далее кратно 0.6 (9) 6.0 6.0
Каналы (13)		H B — 0.3—1.5 кратно 0.3 (14) 0.3—3.0 (15) —
Тоннели (16)		H B — 1.8—2.4 кратно 0.3 (17) 1.8—2.4 кратно 0.3 (18) — 2.4—3.6 кратно 0.6 2.4—4.8 кратно 0.6 —
Опускаемые ворота (19)		$D(a)$ H — 3.0—7.5 6.0—11.4 — 9.0—24.0 6.6—21.0 — 30.0—42.0 9.0—30.0 — 48.0—60.0 15.0—36.0 —
Фундаменты железобетонных и стальных колонок зданий в сооружениях (20)		h b b_n Кратно 0.3 (21) Кратно 0.3 Кратно 0.3

[Key to this portion of table on following page]

Key to "Underground Structures" portion of Table:

1. Structure
2. Diagram of structure
3. Dimensions
4. Underground structures
5. Retaining walls
6. 1.2 to 4.8 in multiples of 0.6
7. 2.1 to 6.3 in multiples of 0.6
8. Single-span
9. 3.0 and up, in multiples of 0.6
10. 3.0 and up, in multiples of 1.5
11. Basement production premises (basements)
12. Multispans
13. Channels
14. 0.3 to 1.5 in multiples of 0.3
15. 0.3 to 2.4 in multiples of 0.3; 3.0
16. Tunnels
17. 1.8 to 2.4 in multiples of 0.3; 2.4 to 3.6 in multiples of 0.6
18. 1.5 to 2.4 in multiples of 0.3; 2.4 to 4.8 in multiples of 0.6
19. Caissons
20. Foundations of reinforced concrete and steel columns of buildings and structures
21. Multiples of 0.3

Basement production premises may be either free-standing or built-in in a shop building. Standard basement components are designed for loads of up to 10 t/m² on ceilings and adjacent floor sections. Basement walls and roofs are prefabricated; foundations and floors are poured.

Channels (blind) designed for running various pipelines, cables and other utilities, are made with prefabricated reinforced trough-type concrete. Tunnels (open) are designed for running pipelines and other utilities which may require service while in operation. The tunnels are made of prefabricated concrete in three versions: trough elements, L-shaped wall elements and closed sections.

Caissons are used for pump stations, water intakes, sprinklers and other deep-set production equipment. Circular caissons can be either prefabricated or poured; rectilinear ones are primarily poured. In addition to caisson types, there are also "wall-in-earth" types.

The form dimensions for poured foundations of reinforced concrete and steel building and structure columns are standardized at multiples of a 300-mm module. This permits laying foundations using only six type-sizes of form panels: 1,200, 1,500 and 1,800 mm long and 300 and 600 mm wide, with a 750-mm column base permitted for columns 300 mm in cross-section. Modular foundation dimensions permit the use of factory-finished reinforcing fabric.

Liquid-Holding Tank Structures. Water tanks are rectangular: precast tank walls in the form of flat panels locked into notches in the bottom or in the form of panels with a heel; poured bottoms and tops -- with precast single-story floor panel elements or special 3x6 m panels supported at the corners. Tanks have a

(22) Емкостные сооружения для жидкостей

		H	A	B
(24) Резервуары для воды	 (23) Столб колонг 3х6 Столб колонг 6х6	3,6	3—15 12—30	6 12
		4,8	18—30 24—36 30—48 48—72	18 24 36 54
(25) Аэрогенераторы		4,8; 5,4	Кратно 6	12; 24; 36
			(26)	
(27) Очистные сооружения различного назначения; открытые		1,8—6,0 кратно 0,6 (28)	6—18 кратно 3; 18—36 кратно 6; 48 (29)	6; 9; 12 далее кратно 6 (30)
(31) Резервуары для воды		H	D	—
		3,6	4,8; 6; 9	
(32) Резервуары для нефти		H	A	B
		3,6	6; 12	6; 12
		4,8	6—30 6; 48 (33)	6—24 кратно 6 (34)
		6,0	24; 30	30

Key to "Liquid-Holding Tank Structures" portion of Table:

22. Liquid-holding tank structures
23. Column grid 3x6; column grid 6x6
24. Water tanks
25. Aeration tanks
26. Multiples of 6
27. Various treatment plants (open)
28. 1.8 to 6.0 in multiples of 0.6
29. 6 to 18 in multiples of 3; 18 to 36 in multiples of 6; 48
30. 6; 9; 12 and up in multiples of 6
31. Water tanks
32. Fuel oil tanks
33. 6 to 30 in multiples of 6; 48
34. 6 to 24 in multiples of 6

useable height of 3.6 m for up to 1,400 m³ capacity and 4.8 m for larger capacities and are installed in sections, with 3-m and 6-m sections added to side A. Aeration tanks are made with exactly the same panels as other tanks, but have their own reinforcing. There are no covers, the bottoms are poured, and the useable height is 4.8 or 5.4 m.

Open structures of various kinds -- mixing and settling ponds, sand- and oil traps, and so on -- are made with exactly the same panels as other aeration tanks, with poured bottoms.

Cylindrical tanks are assembled from constant-thickness panels with prestressed circular reinforcing; the bottoms are poured. Given diameters of up to 6 m, the panels are curvilinear, with a constant vertical thickness; for diameters over 6 m, the panels are rectilinear inside and curvilinear outside.

Cylindrical-section treatment tanks are made with exactly the same panels as other tanks; bottoms are poured.

Fuel oil tanks are rectilinear and use exactly the same dimensions and elements as water tanks, but their reinforcing is designed to take into account the temperature effects of the oil as it is heated.

(35) Емкостные сооружения для хранения сыпучих материалов			
Закрытые (36)		H	a
		3.6; 4.8; 6	6; 9
Следом за слоистыми корпусами (37)		D	H
		6	9.6; 14.4; 19.2
		12	18; 30; 26.4
		(38) 18 (одинок.)	30
			84; 9.2; 11.2

Key to "Bulk Dry Materials Storage Tanks" portion of Table:

- 35. Bulk dry materials storage tanks
- 36. Bins
- 37. Silos and silo blocks
- 38. (solitary)

Bulk Dry Materials Storage Tanks. Silos are circular, with 6-, 12- and 18-m diameters and can be precast using curvilinear elements or poured using movable or traveling forms. The main circular reinforcing is wire, prestressed in the case of precast elements. First-story columns are precast; foundations are poured as a continuous slab. Silos 6 and 12 m in diameter can be solitary or interconnected into single- or double-row blocks. Silos 18 m in diameter are to be solitary only.

Surface Structures. Trestling is built for exposed equipment and utility lines and can be both inside and outside buildings. Trestling uses multistory building precast reinforced concrete and steel components and is designed for loads of 2-2.5 tf/m². It should be noted that multistory building components are now being anticipated, which will necessitate reviewing trestling components as well.

Open crane trestle dimension diagrams provide for spans of 18, 24 and 30 m for single-story buildings and 10-32 tf overhead cranes under GOST 1575-81 and GOST 25711-83.

(39) Надземные сооружения				
Элементы (40)		$H_1; H_2; H_3$	I	σ
		4.8; 6; 7.2	6; 9	от 0.8 до 2.5 тс/м ² (42)
Отдельно стоящие боксы под техноло- гические трубопроводы (43)		H	b	σ (тс) (45)
		5.4-7.8	1.2-2.4	1; 2; 3; 5
		0.9; 1.2	2.4-4.8	8; 10; 20
		5.4-7.8	2.4-4.8	
		8.4; 6	2.4-4.8	20; 30
(46) Одно- и двухярус- ные вставки под технологические трубопроводы		H	b	σ (тс) (45)
		6; 6.6; 7.2; 8.4	1.2-4.8	0.35-2.0
			4.8-7.8	2; 3; 4
		5.4-8.4	4.8; 6; 7.8	11; 1.5; 2; 3.5
(48) Галереи в ярусах		H_0	B_0	L
		2.4; 2.7	3.0-9.0 кратно 2.6	12-30 через 6 (50)
(51) Открытые краевые вставки		H	L	Q (тс) (45)
		7.55	18; 24; 30	15; 10; 16; 30
		9.35; 11.75		10; 16; 20 32; 50
(52) Галереи (секци- онные)		Сетка колонн	Размер сечени	H
		4x4	4x8 8x8 12x16	8.4 9.9 10.4-12.0
		9x6	18x24	10.8
(55) Водонапорные башни		H	D или B	-
		12-48 кратно 6	(56) 3; 3.6; 4.2; 7.2	-
		(57)		

Key to "Surface Structures" portion of Table on following page.

Key to "Surface Structures" portion of Table:

39. Surface Structures
40. Trestling
41. 6-m spacing
42. From 0.5 to 2.5 tf/m²
43. Free-standing supports for process pipelines
44. "cm." = column; "sp." = crosspiece/span
45. q (tf)
46. Single- and double-span trestling for process pipelines
47. "cm." = column; "sp." = crosspiece/span
48. Galleries and trestles
49. 3.0 to 9.0 in multiples of 0.6
50. 12 to 30 every 6
51. Open crane trestling
52. Cooling towers (sectional)
53. Column grid
54. Section size
55. Water towers
56. D or B
57. 12 to 48 in multiples of 6

The dimensional diagrams for free-standing supports for process pipelines follow GOST 23237-78, "Free-Standing Supports for Process Equipment. Types and Basic Parameters." The supports are precast and reinforced.

The dimensional diagrams for trestling for process pipelines follow GOST 23235-78 and GOST 23236-78, "Single- and Double-Span Trestling for Process Pipelines. Types and Basic Parameters." The trestle supports are precast and reinforced; the span crosspieces are reinforced and steel.

Conveyor galleries are horizontal and inclined, with steel bearing components and spans of 18, 24 and 30 meters, depending on the slope. Galleries are 2.4 and 2.7 m high in the clear; they are 3-9 m wide in 0.6-m increments. Standard gallery components are in need of considerable review and improvement.

Railroad unloading trestles are of two types: on embankments between reinforced retaining walls, for embankments up to 3 m high, and with steel span structures at heights of 6 and 9 m, with 12-m spans.

Ventilation system cooling towers are made with a precast reinforced concrete frame and a 4x4-m column grid for heights of 8.4 to 12 m and with column grids of 9x9 and 6x9 m for heights of 10.8 and 11.5 m.

Cooling towers are commonly 18x18 and 27x27 m square and 36 or 42 m high, using a steel frame with wood or asbestos-cement sheathing. Cooling towers can also be reinforced poured concrete (in the shape of a hyperbolic paraboloid) in a traveling form 45-72 m in diameter and 51-87 m high.

The dimensional diagrams for water towers are established for towers with a frame-type precast reinforced concrete column using the column forms used for multistory buildings. The steel platforms are the cross-pieces of the column's

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framework lattice. Exactly the same bottom and tank elevations should be used for brick-column and reinforced poured-concrete cylindrical towers.

Each dimensional scheme requires its own mix of components, which have limited other applications, inasmuch as similar structures are by no means always being built at the same time in any given region. Therefore, an attempt has been made to create a unified mix of components which can be used for a number of different structures. At the author's suggestion, standardized wall panels (UPS) have been developed for a number of underground structures (see BETON I ZHELEZOBETON, No 12, 1984). These panels can be used for retaining walls, tunnels, rectangular tanks (reservoirs, aeration tanks, and so on) for both water and fuel oil. This approach permits manufacturing all panels in five type-shapes (four, with subsequent development), with slight adaptations to the forms and with their own reinforcing for various types of panels. These will replace the 46 different type-sizes of panels using the current standard designs.

When current standard designs are reviewed, greater use should be made of high-strength concrete (up to class V 60), high-strength prestressed reinforcing, and steel-fiber concrete (for troughs, between-floor slabs, and so on). More extensive use should be made of effective sections in place of rectangular ones, and foremost of I-beam sections for various kinds of columns, which will permit a reduction in the materials-intensiveness and cost.

Standardizing Agricultural Construction Components Catalog

UDC 721.013:389:6:[728.9+725.4]

Moscow PROMYSHLENNOYE STROYTELSTVO in Russian No 3, Mar 86 pp 24-27

[Article by candidates of technical sciences R. I. Rabinovich and A. M. Rivkin and engineer I. A. Trus (TsNIIpromzdanii, USSR Gosstroy): "Standardizing Agricultural and Industrial Construction Components"]

[Text] The USSR Food Program anticipates considerable expansion of capital investment in agricultural production construction. Given this, substantially greater demands are being made on the designs of buildings and structures, since running technological processes efficiently and lowering construction net cost and labor intensiveness are inseparably linked to intelligent space-layout and design resolutions.

Improving the standardization system is an important aspect of design, as it permits simplifying the actual design process and accelerating the start-up of construction projects.

Institutes of the USSR Minselkhoz [Ministry of Agriculture], USSR Minselstroy [Ministry of Rural Construction], USSR Gosstroy, and other organizations have been working hard to standardize construction design. In particular, they have developed standards for dimensional diagrams and parameters of single-story agricultural buildings, published a "Unionwide List of Standard Plans and Standard Design Resolutions for Agricultural Production Buildings, Structures and Enterprises for Construction in the 12th Five-Year Plan" for agricultural construction,

and developed a "Unionwide Construction Catalog of Standard Components and Items" and "Unified Specifications (YeTU) for Construction Planning for Agricultural Projects" for 27 zones nationwide.

At the same time, there are reserves for raising the level of standardization of construction resolutions, reserves associated with broadening the field of interbranch standardization. One result would be a reduction in the size of the mix of components through standardization of the designs of a single designation which are used in various branches of the national economy, for example, components used in agricultural production construction.

Currently, given use of the contract method, agricultural construction is done by a variety of ministries and departments, with the capital investments being distributed nationwide among them as follows: USSR Minselstroy and Union-republic interfarm construction administrations -- 44 percent of the total; USSR Minvodkhoz [Ministry of Land Reclamation and Water Resources] and the general construction ministries (USSR Minstroy [Ministry of Construction], USSR Mintyazhstroy [Ministry of Heavy and Transport Machinebuilding], USSR Minpromstroy [Ministry of Industrial Construction], USSR Minvostokstroy [Ministry of Construction in the Far East and Transbaykal Regions], USSR Minenergo [Ministry of Power and Electrification], USSR Mintransstroy [Ministry of Transport Construction] and others) -- 19 percent.

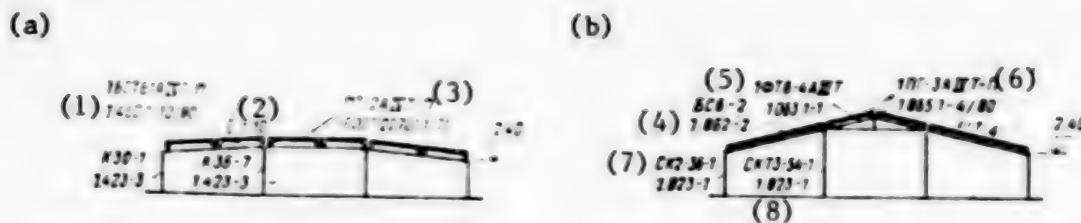
Contractor organizations of the USSR Minselstroy and the interfarm construction administrations use the agriculture mix to build agricultural production buildings and the industrial mix to build their own base. The contractor organizations of the remaining ministries and departments generally use only an industrial mix in many zones of the country, while the standard plans for the basic stockraising and poultry farm buildings, which comprise about 50 percent of all agricultural production construction, were developed for use with components from the agriculture mix. Components of both mixes are used in plans for buildings and structures for agricultural services enterprises.

Thus, current agricultural construction practice necessitates a substantial reworking of plans used by contractor organizations of the industrial ministries and departments and does not facilitate reducing the total mix of components. In this connection, interbranch standardization of the components of single-story industrial and agricultural buildings and the creation of an optimum mix of components for the construction of agricultural production buildings using designs from the agricultural and industrial products mixes seems appropriate.

The above can be illustrated by the results of a comparison of the technical-economic indicators (per square meter of floorspace) of common economic resolutions of basic buildings with internal supports of a three-span pillar-beam $L = 6 + 6 + 6 = 18 \text{ m}$ type (Figure 1, following page) using components from the industrial and agricultural products mixes per $18 \times 6 \text{ m}$ cell for the conditions in Moscow Oblast (Table 1, following page).

In this instance, the building's diameter is arranged using reinforced concrete components from the industrial mix: 300x300 mm columns, beams and multipurpose slabs; and from the agricultural mix: 200x200 mm columns, beams, girders and

Figure 1. Structural Diagram of the Diameter of an Agricultural Building
 $L = 18 \text{ m}$



Key:

- a) using elements from the industrial products mix
- b) using elements from the agricultural products mix

- | | |
|------------------------------------|-----------------|
| 1. 1BST61A IV T-P | 4. BS6-2 |
| 2. $i = 1:10$ | 5. 1FT6-4 III T |
| 3. PT-2A IV T-P
GOST 22701 1-71 | 6. 1PG3A IV T-P |
| | 7. SK2-36-1 |
| | 8. SKT3-54-1 |

Table 1

(1) Конструктивные элементы	Для варианта с конструкциями промышленной инженерии				Для варианта с конструкциями сельскохозяйственной инженерии			
	(2)		(7) стоимость в деле, руб.	(8) трудозат- раты на строитель- ство, чел.-чес	(4) расход материалов		(7) стоимость в деле, руб.	(8) трудозат- раты на строитель- ство, чел.-чес
	бетон, см	сталь, кг			(5)	(6)		
(9) Клонны	1.41	1.7	2.53	0.17	1.24	1.17	2.19	0.17
(10) Балки и фермы	1.25	1.34	1.85	0.07	1	2.56	2.21	0.05
(11) Плиты с утепли- телем и кровлей	5.94	4.5	22.4	2.27	5	4.44	16.11	1.64
(12) Всего	8.6	7.54	26.78	2.51	7.24	8.17	20.51	1.86

Key:

- 1. Structural elements
- 2. For variant with industrial-mix components
- 3. For variant with agricultural-mix components
- 4. Materials used
- 5. Concrete, cm
- 6. Steel, kg
- 7. Actual cost, rubles
- 8. Labor expenditures at the construction site, man-hours
- 9. Columns
- 10. Beams and girders
- 11. Insulated slabs and roofs
- 12. Total

slabs. Foundations were not examined, since there are no precast foundations in the industrial products mix. When using components from the industrial mix, roofing is assumed to be rolled and laid on a 1:10 slope and to employ highly-rigid mineral-wool sheet insulation; for the agricultural mix -- fiber asbestos-cement sheet, a 1:4 slope, and semirigid mineral-wool sheet insulation.

The data in Table 1 indicate that, as a whole, use of industrial-mix components leads to an increase in concrete expenditure per building cell and an increase in the cost and labor-intensiveness of putting up the structure, while steel used drops. Frames made of industrial- and agricultural-mix components are not compared, due to the different roof slopes.

At the same time, analysis of the data on individual structural elements shows that the increased cost and labor-intensiveness when industrial-mix components are used is to be explained by the use of a firmer insulation, which is more expensive and which requires higher labor expenditures to install at the site than the semirigid insulation used in agricultural-mix components.

Table 1 indicates the appropriateness of using 200 x 200 mm agricultural-mix columns. Calculations show that annual losses from the use of industrial-mix columns are about 10 million rubles, 100,000 m³ of concrete and 3,800 tons of steel.

The use of industrial rafters leads to a reduction in steel use and cost and an increase in concrete use, with approximately identical labor intensiveness. The use of industrial-mix slabs leads to substantially higher concrete use and identical steel use. Thus, the example given graphically illustrates that use of the industrial products mix when building agricultural industrial buildings can lead to higher expenditures of materials and increased installation cost and labor expenditures.

There are currently a whole series of interbranch components and items such as 6-, 9-, 12- and 18-m prestressed rafter girders, 6-m T-section purlins, and so on.

Let's examine possible ways of improving the components of the industrial and agricultural products mixes with a view towards their interbranch standardization.

Columns and Foundations. Series 1.823.1-2 reinforced concrete columns are currently used to frame out the pillar-beam structure of single- and multiple-span agricultural buildings. Precast foundations with a minimal crown elevation of -0.5 m are used under 200 x 200 and 300 x 300 mm columns up to 6,400 mm long, with the foundations under the end-row columns sunk to -1.15 m, -1.45 m and -1.75 m (Figure 2, following page); foundations under 400 x 400 and 500 x 500 mm columns up to 8,100 mm long are poured, with a minimum crown elevation of -0.15 m. Column lengths are given in Table 2 (following page). Foundation joint attachment depth is 400 mm (for precast foundations) or 750 mm (for poured foundations).

Columns for single-story industrial buildings without overhead cranes are Series 1-423-3. The columns in this series are 300 x 300, 300 x 400, 400 x 400, 400 x 500 and 500 x 500 mm for the range of story heights used in agricultural buildings. Column lengths are given in Table 2.

It should be noted that the standard foundation components for industrial buildings differ from those for agricultural buildings in that they are designed for below-grade work prior to column installation. In all instances, the crown

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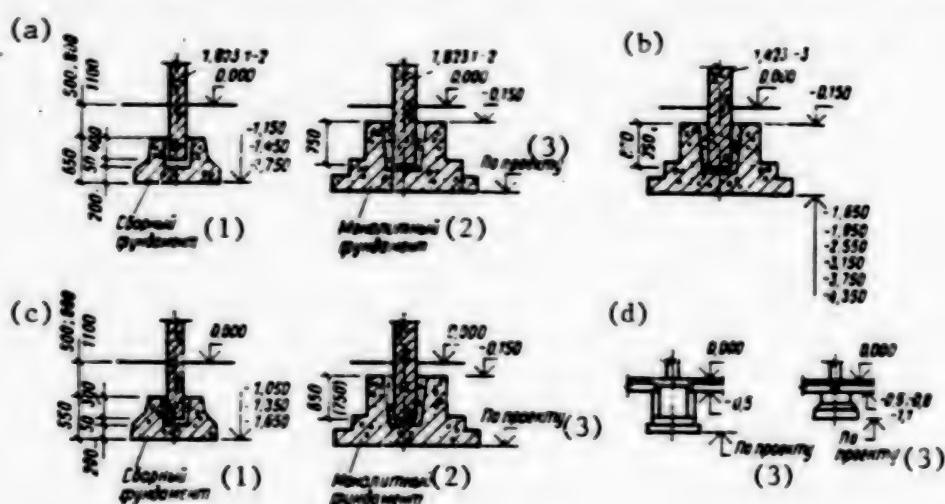
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Figure 2. Mating of Columns and Foundations; Foundation Beam Support



Key:

- a) using agricultural series 1.823.1-2
- b) using industrial series 1.423-3
- c) proposed resolution
- d) foundation beam support

1. Precast foundation
2. Poured foundation
3. Planned

Table 2.

(1) Промышлен- ной номенклату- ры		(2) Сельско- хозяйственной номенклатуры		Предлагаемой объединенной номенклатуры	
край- (4)	сред- (5)	край- (4)	сред- (5)	край- (4)	сред- (5)
		3300	3300	3200	3200
		3600	3600	3500	3500
3600	3800	3900	3900	3800	3800
		4200	4200	4100	4100
4400	4400	4500	4500	4400	4400
		4800	4800	4700	4700
5000	5000	5100	5100	5000	5000
			5400	5300	5300
5600	5800	5700	5700	5600	5600
		6000	6000	5900	5900
6200	6200	6300	6300	6200	6200
			6500	6400	6400
6800	6800		6900	6800	6800
6900	6900		6900	6900	6900
8100	8400		8100	8100	8100

Key:

1. Industrial products mix
2. Agricultural products mix
3. Proposed combined products mix
4. End
5. Middle

elevation of the foundation is -1.15 m and the foundation depth as a function of ground frost depth does not depend on column length (see Figure 2).

We propose a combined column product mix based on the industrial mix plus the type-sizes it lacks to provide a full set of agricultural building heights in accordance with the GOST and to provide the most economical, 200 x 200 mm, column sections (Table 2). The column lengths provided are provisional, inasmuch as the area of application of the dimensional diagrams will need to be determined when drawing up the products list for various combinations of parameters and taking technological requirements into account (the TsNIIpromzdaniy is working on this).

Introduction of a combined products mix will permit a reduction in the total number of type-sizes for end and middle columns from 57 to 44 (Table 3) in use simultaneously in the industrial and agricultural products mixes.

Table 3

Название конструкций (1)	Промышленной номенклатуры (7) шт	(8) Сельскохозяйственной номенклатуры Всего	Предлагаемой объединенной номенклатуры (10)	Примечания (11)
(2) Колонны: крайние (3) средние (4)	10 9	16 22	26 31/37 24/44	(12) Рассматриваются колонны длиной до 8100 мм
(5) Панели покрытий: 3x6 м 1,8x6 м	9 5	4 4	13 9/22 8/14	Число типоразмеров объединенной номенклатуры указано для каждого района по снеговой нагрузке (13)
(6) Стеновые панели трехслойные горизонтальной разрезки	51	24	75	60

Key:

1. Components
2. Columns:
3. End
4. Middle
5. Roof slabs:
6. Triple-layer wall panels, horizontal cross section
7. Industrial mix
8. Agricultural mix
9. Total
10. Proposed combined products mix
11. Notes
12. Examined columns up to 8,100 mm long
13. Number of combined-mix type-sizes indicated for each snow-load region

We also propose changing the foundation height for the 1.812.1-1 series from 650 to 55 mm by reducing the column attachment depth in the skirt from 400 to 300 mm, inasmuch as the maximum reinforcing diameter for 300 x 300 mm columns is Ø 16ASh.

In poured foundations, we propose having two column depth values: 650 and 750 mm. The foundation contour interval elevations for the end columns are: -1.05, -1.35 and -1.65 m, which meshes well with the standardized series of depth values for the foundations of industrial buildings.

Given the minimum crown elevation for precast foundations (-0.5 m), the foundation beams are to rest on the crowns of the foundations. For other elevations, the foundation beams rest on the subconcrete or precast posts (see Figure 2).

It should be noted that the use of shortened foundation beams of various type-sizes is anticipated if poured foundations are installed in a standard series. It seems appropriate to work on changing the crown elevations of poured foundations so as to reduce the number of type-sizes of foundation beams.

We know that the usual roof slope for the main buildings of livestock and poultry enterprises is 1:4, which provides natural insulation ventilation and snow-melt runoff without additional measures in all regions of the country when the roof is made of fiber asbestos-cement sheet. Frame elements have been developed for framing for this slope, as have purlin roof components in the form of beams and girders for a pillar-beam type of frame.

Research done by the TsNIIpromzdaniy's roofs and roofing laboratory on optimum parameters for asbestos-cement roofing and agricultural buildings has shown that, given a pitch of up to 12 m, roofs with a slope of 1:5 ensure water runoff in 98 percent of the USSR. In buildings with a pitch length of up to 9 m, a slope of 1:6 provides the same results.

It would seem appropriate to adopt an asbestos-cement roof slope of 1:5, instead of the current 1:4. This would reduce building volume. In buildings with intermediate columns, the difference in the crown elevations of the middle and end columns become multiples of 0.3 m, enabling one to have middle foundations at a common elevation. A comparison of the parameters for different slopes is given in Table 4.

Высота здания, м	Пролет, м	Крайние колонны (3)	(6) Средние колонны							
			(7) Уклон кровли 1:4				(8) Уклон кровли 1:5			
			(4) Длина, м	(5) Отметка подошвы фундамента, м	(9) Отметка верха колонн, м	(10) Отметка подошвы фундамента, м	(9) Отметка верха колонн, м	(10) Отметка подошвы фундамента, м	(5) Отметка подошвы фундамента, м	
2.4	6	3.2	-1.05	3.9	4.7	-1.05	3.6	4.4	-1.05	
	7.5	3.2	-1.05	4.275	5	-0.975	3.9	4.7	-1.05	
	9	3.2	-1.05	4.65	5.3	-0.9	4.2	5	-1.05	
2.7	6	3.5	-1.05	4.2	5	-1.05	3.9	4.7	-1.05	
	7.5	3.5	-1.05	4.575	5.3	-0.975	4.2	5	-1.05	
	9	3.5	-1.05	4.95	5.6	-0.9	4.5	5.3	-1.05	
3.0	6	3.8	-1.05	4.5	5.3	-1.05	4.2	5	-1.05	
	7.5	3.8	-1.05	4.875	5.6	-0.975	4.5	5.3	-1.05	
	9	3.8	-1.05	5.25	5.9	-0.9	4.8	5.6	-1.05	

Key to Table 4 on following page.

Key to Table 4, preceding page:

- | | |
|---------------------------------|-------------------------------|
| 1. Story height | 6. Middle columns |
| 2. Span, m | 7. Roof slope 1:4 |
| 3. End columns | 8. Roof slope 1:5 |
| 4. Length, m | 9. Column crown elevation, mm |
| 5. Foundation base elevation, m | 10. Minimum length, m |

Roof Slabs. Prestressed 1.5 x 6 and 3 x 6 m Series 1.865.1-4/80 slabs 250 mm high with a cross rib spacing of 1.5 m are used for the roofs of single-story agricultural buildings.

Prestressed 1.5 x 6 m Series 1.465-7 and 3 x 6 m GOST 22701.1-77 slabs are used in industrial buildings. The slab height is 300 mm; cross rib spacing is 1.5 m in slabs 1.5-m wide and 1 m in slabs 3-m wide.

The indicated components are used in buildings with nonaggressive and aggressive media. It should be noted that different maximum displacement normatives are used for designing slabs for the products mix being examined here.

A comparative analysis of materials-expenditure data shows that use of industrial-mix roof slabs in agricultural buildings leads to an increase in concrete expenditures, with approximately equal amounts of steel used for slabs without floor openings and less steel used for slabs with floor openings.

It would seem appropriate to develop a unified products mix of roof slabs for single-story industrial and agricultural buildings, using slabs in two height type-sizes, 250 and 300 mm, depending on the construction region. Were this to be done, use of this combined roof slab mix would enable us to reduce the number of brands by 25-28 percent, calculated at eight for each snow-load region (see Table 4).

Wall Panels. The "Unionwide Construction Catalog of Standard Components and Items for All Types of Construction" basically uses the following resolutions for wall enclosures of single-story frame buildings (column spacings to 6 m):
double-layer Series 1.832.1-9 and triple-layer Series 1.832.1-8 panels for agricultural buildings;
single-layer Series 1.432.14/80 and triple-layer Series 1.432.12 panels for industrial buildings.

Work done at the TsNIIpromzdaniy has demonstrated the inappropriateness of using two-layer lightweight concrete wall panels for agricultural buildings, inasmuch as they are 44 percent more expensive than three-layer panels, on average. It therefore seems appropriate to develop a unified series of triple-layer panels for single-story industrial buildings and the main agricultural buildings, which will permit reducing the number of panel type-sizes to 15 (see Table 3).

Existing single-layer panels are recommended for use in auxiliary and subsidiary buildings.

Girders, Beams, Frames. Girders and beams are used as reinforced concrete pur-lin components in agricultural building pillar-beam frame construction. Series

1.063.1-1 triangular reinforced concrete purlin girders are for interbranch use. Girder spans are 6, 9, 12 and 18 m; height on support is 450 mm for all types of girders.

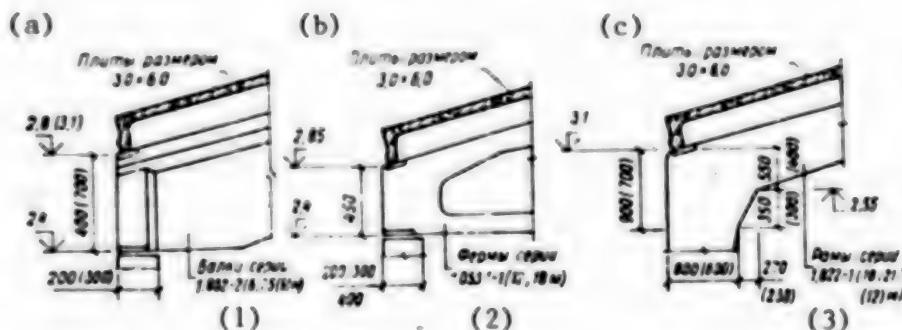
Prestressed reinforced concrete beams in 6, 7.5, 9 and 12 m spans are used for roofs of buildings with a pitch of 1:4 for the 1.862.1-5 agricultural series, with a single height on lower support of 400 mm.

Both industrial- and rural-mix components are used for attic floors and roofs with flat or slightly sloping roofs: Series 1.849-1 beams for 7.5 m bays, Series 1.462.1-10/80 beams for flat and single-pitch roofs for 9 and 9 m bays, Series 1.462.1 beams for single-pitch (1:10 slope) 12-m bays, and Series 1.462-3 beams for double-pitch (1:12 slope) 12-m bays.

Series 1.822-2 reinforced concrete three-hinged 12-, 18- and 21-m frames for frame agricultural buildings.

Analysis of the structural resolutions of frame buildings showed that frame and pillar-beam components are not interchangeable. Thus, under the GOST, the outside corner elevation of a frame must be a multiple of 0.3 m (which requirement is not followed in the plans). At the same time, the beam and girder height on support is 45 or 40 cm, not a multiple of 0.3 m, and so the elevation of the upper corner of the support portion of purlin components is not a multiple of 0.3 m either (Figure 3). This eliminates the possibility of having a common wall design in a single standard plan employing two different frame designs.

Figure 3. Reinforced Concrete Frame Corners of Single-Story Agricultural Buildings



Key:

- a) beams resting on columns -- 3.0 x 6.0 slab size
 - b) girders resting on columns -- 3.0 x 6.0 slab size
 - c) frame juncture -- 3.0 x 6.0 slab size
1. Series 1.862-2(6, 7.5, (9) m) beams
 2. Series 1.053.1-1(12, 18 m) girders
 3. Series 1.822-1(18, 21 (12) m) frames

We propose reworking 1:5 slope girders, beams and frames and adopting 450 mm as the beam height on support and the distance between inside and outside frame corners (instead of the 400 and 500 mm in existing components). Were this to be done, both the height of the premises and the elevations of the upper corner of the support portions of purlin components and frames would be standardized. Moreover, it would seem appropriate to optimize beam cross-section widths and coordinating them with industrial-mix components.

Conclusions

When necessary to install ventilated roofs on main buildings at agricultural enterprises, it would seem appropriate to switch to a slope of 1:5. For this, we are recommending an adjustment to GOSTs 23839-79 and 23840-79 to reflect the change in the roof slope and also coordination of premises heights for frame and pillar-beam designs.

It is appropriate to develop a unified interbranch products mix of columns, roof slabs and triple-layer wall panels for single-story industrial and agricultural buildings and to research the appropriateness of interbranch standardization of single-layer wall panels. Development of a unified products mix will permit a reduction of 20-35 percent in the number of type-sizes of the indicated components as applicable to each region.

We are recommending reworking the designs of beams, girders and frames with a view towards making them interchangeable in frame and pillar-beam designs; in this regard, beam cross sections should be optimized and coordinated with the components of the industrial products mix.

It is appropriate to use precast reinforced concrete foundations from the agricultural products mix for industrial buildings with corresponding parameters.

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HOUSING CONSTRUCTION

PLANS TO EXPEDITE PARTY'S HOUSING CONSTRUCTION PROGRAM

Moscow STROITELNAYA GAZETA in Russian 27 Apr 86 p 1

[Article: "Ways of Solving the Housing Problem"]

[Text] Our Leninist party has formulated the essence of its social program as: everything for the benefit of the people, in the interests of society.

The available housing in our country has doubled over the past 20 years and is presently about four billion square meters. Some 80 percent of the urban population lives in single-family apartments, and the availability of well-built housing in rural areas has also increased significantly.

However, in spite of our undisputed achievements in this area, the housing problem remains critical.

Systematically implementing the policy adopted by the 27th Party Congress of accelerating development of the social sphere, the CPSU Central Committee recently adopted a decree "On the Basic Directions of Accelerating Solution of the Country's Housing Problem," which defines a specific program of action to attain the important goal of providing every family with an individual apartment or house by 2000. Considerable progress along this line must be made in the current five-year plan.

Accelerated resolution of the housing problem must, the decree states, be a nationwide effort. It will require persistent effort, energy and initiative of all party, state, economic and soviet agencies, trade unions and the Komsomol. But there are, to be sure, considerable reserves. Along with the leading house-building enterprises, which consistently carry out the plans and build good-quality homes smoothly, there are also enterprises which have accustomed themselves to production interruptions, to incomplete and substandard work.

The ministries and departments, local, party, soviet and trade-union organizations, and economic leaders are called upon to strictly monitor the timely, smooth release of housing for occupancy; this also applies to cultural and social facilities. The role of the local soviets in coordinating all housing construction, in particular, is being increased. It is also time to think about setting up extra-departmental monitoring of housing construction quality. It is important to use the leading experience of house-builders in Tomsk, Cheboksary,

Petropavlovsk-Kamchatskiy, Kiev, Vilnius and other cities in which even work throughout the year has been achieved.

It is necessary to set up unionwide socialist competition for successful fulfillment and overfulfillment of housing construction plans and for all social and cultural construction among the republics, krais and oblasts. Backed by labor competition among the brigades, sectors, shops and enterprises, by a precisely adjusted integral-process brigade contract, and by cooperation among related suppliers following the "Worker Relay Race" principle, the unionwide competition among our urban-development construction workers will help disseminate leading experience more widely, pull up the laggards more quickly, and bring the "average" up to the level of the leading collectives.

In order to accelerate resolution of this most important social task, we will be faced not only with reaching the frontiers planned for the five-year period, but also with significantly exceeding the planned amounts of housing to be built. In order to do this, every source of funds, every reserve, should be used. We recognize the appropriateness of broadening the rights of local soviet agencies so as to open up a broad expanse for initiative, for actively enlisting the broad masses of workers in solving the housing problem.

The amounts of housing built using enterprise and organization funds will increase significantly. They will be given top priority in the allocation of material-technical resources and contractor work limits [approved costs]. In this regard, the practice of enlisting the collectives of these enterprises to help the construction workers and the direct-labor method of putting up housing will be further developed. Larger-scale cooperative and individual construction is planned. In this regard, enterprises will be materially assisting their own leading workers and young people using their own incentives funds. Broader use will also be made of partial reimbursement of state expenditures on improving the finishing and equipping of apartments to order for their occupants. One other acceleration reserve is housing complexes for young people which are erected with the personal labor participation of the future residents.

Improvement in worker living conditions will be facilitated by a proprietary attitude towards housing, by timely capital repair, technical and other modernization. In order to increase the levels of such work, we need to strengthen our construction-maintenance services and to create every condition necessary for them to work very efficiently. It is very important that maintenance and modernization be done in a planned manner. To this end, all housing should be inventoried. No housing suitable for occupancy should be demolished unless absolutely necessary.

It is extremely important that immediate steps be taken to strengthen and make the best possible use of the production base for housing construction. Large-panel house-building enterprises require special attention. We currently operate 545 DSK [house-building combines], and about 60 percent of the housing being built today uses fully prefabricated components. However, many enterprises are still operating at half-speed, using obsolete technology. Serious oversights are being permitted both in renovating existing plants and in creating new ones. We need to quickly ensure better utilization of the designed capacities of KPD [large-panel house-building] enterprises, as well as increase the number of such

enterprises and bring into play every reserve for increasing production efficiency. Accelerating progress in house-building will be facilitated by the creation of scientific-planning-construction associations and architectural-engineering and interdepartmental scientific-technical centers. The Gosgrazhdanstroy [State Committee for Housing and Civil Construction] and its institutes should accelerate this work. We also need to complete the transfer of all KPD enterprises to producing output based on new standard plans.

Strict observance of the principle of social justice in housing distribution is of great importance to solving the housing problem, the more so since violations are still being permitted quite often in establishing apartment allocation priority, including in the collectives of our branch. The trade-union organizations and the public at large need to increase their monitoring of observance of the established norms for distributing department housing, broadly publicize and resolutely cut short any violations and abuses in this work.

The party views social policy as a powerful means of accelerating the country's development, of heightening the labor and sociopolitical activeness of the masses, of shaping the new man and establishing the socialist way of life. Our builders, relying on nationwide assistance and support, are doing everything they can to resolve a task of particular political and social significance, of providing each family with well-built, separate housing by the end of the second millennium.

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HOUSING CONSTRUCTION

UDC 69.057:728

STANDARDIZATION OF FULL-PANELED PREFABRICATED HOUSING CONSTRUCTION

Moscow ZHILISHCHNOYE STROITELSTVO in Russian No 3, Mar 86 pp 12-13

[Article by engineer Ya. M. Felman (Moscow): "Fully Prefabricated Housing Construction At a New Level"]

[Text] Developing fully-prefabricated house-building and increasing its technical-economic effectiveness will require a new approach to standardization in housing and civil construction.

The "All-Union Catalog of Factory-Finished Items" has still not become a tool which will ensure maximum component standardization based on the consolidated layout module and unified connecting-joint design. Even TsNIEPzhilishcha [Central Scientific Research and Planning Institute of Standard and Experimental Housing Planning] proposals on setting up large-panel house-building based on architectural - design - technological schemes (AKTS) and KPD-1 and KPD-2 [large-panel house-building] base series handle the structural plans for houses with narrow and mixed transverse bearing wall spacings as isolated systems designed to use different industrial items.

Thus, for example, 120-mm thick between-story spans with separate floors are supposed to be used for houses with small transverse bearing wall spacing, while 220- or 160-mm thick between-story spans are to be used for mixed spacings, meaning different products mixes of load-bearing components. Bearing walls in systems with small transverse wall spacings are 160-mm thick for walls between apartments and 120 mm for walls within apartments, while all the walls in systems with mixed spacings are 160 mm thick.

The mating of vertical wall seams at building corners, loggias and risalites is also resolved in various ways. Whereas in systems with mixed bearing-wall spacings the outside wall panel slits correspond to the axial layout of the building, in systems with small spacings (Series 90), the outside wall panels cover the vertical seams of these places, making for longer wall, socle and parapet panels.

Even modular bathrooms and ventilation units are designed differently in the two structural systems, requiring the use of different, metals-intensive equipment to manufacture them.

In a majority of the larger cities, the production base for fully prefabricated house building includes several enterprises producing parts for different series

and different structural plans, eliminating the possibility of using capacities efficiently by specializing and consolidating production. Under these conditions, a broad products list becomes a significant drag on increasing producer efficiency and introducing housing architecture variants.

It has become necessary to improve the All-Union Catalog as a basis for planning buildings and a tool for improving the quality and economy of industrial construction. Under these conditions, we must base the catalog on 1) choosing a consolidated layout module and 2) using it to choose a specific set of preferred parameters.

The necessity of shifting fully prefabricated house-building to a higher urban-development level predetermines the necessity of unifying into a harmonious system nonframe-design housing and common types of public buildings based on the 3-, 6- and 7.2-m spacings adopted in Series 1.090.

The large-panel housing base series currently being developed will be based on the use of transverse bearing walls with 3 and 3.6-m spacings (small spacing) or 3 and 6-m spacings (mixed spacing). We know that room proportions are not as good when two premises, a living room and a kitchen for example, are positioned in a wide, 6-m spacing. In this connection, we use a method whereby the room as a whole is oriented along the building and occupies the whole 6-m span. This design is optimum, for example, for climate region III, but it is not justified for harsher climates, inasmuch as it is accompanied by an increase in the specific perimeter of the outside walls, and consequently by high heat loss.

In this connection, it would seem appropriate to include a 6.6-m spacing in the catalog. Structuring the catalog on the basis of 3-, 3.6-, 6-, 6.6- and 7.2-m structural-layout spacings will permit the use of two-spacing outside-wall, parapet and socle panels in houses with wide spacings.

The basic between-floor slab design must be that which is most economical: acoustically uniform slabs 160 mm thick with linoleum floors on an insulating, sound-proofing base, which will ensure minimal installation labor-intensiveness. In this instance, we should reject 120-mm thick walls between apartments for sound-proofing considerations, as they are inadequate to the purpose due to indirect noise moving vertically.

Thus, the use of a single inside wall thickness and height for all housing construction in a region will provide full standardization of pouring equipment. The equipment for manufacturing between-floor slabs will also be standardized, opening up opportunities for limited unification of small- and mixed-spacing plans into a unified system.

We are aware of the essential role of built-in public areas in shaping comprehensive urban development. Including built-in stores in apartment housing with narrow transverse bearing wall spacing requires installation of a prefabricated-monolithic platform, whose construction is very metals- and labor-intensive, above the built-in frame portion.

Given a wide transverse-wall spacing, the task is simplified because the divisions of the bearing components of the housing and the built-in portion of the

buildings coincide. Given this, the shift from house-building to urban-development production provides an opportunity to use public-building panel walls for the bearing components of built-in premises.

Particular attention must be paid to standardizing the transverse spans of buildings. Analysis shows that disregard of this factor, even when consolidated 6M modules are used, leads to unjustified increase in the products mix of industrial items. Thus, for example, the TsNIIEPzhilishcha's AKTS1 system plan calls for six spans between longitudinal walls: 3, 3.6, 4.2, 5.4, 7.2 or 1.8 m. Similar work done by the KievZNIIEP [Kiev Zonal Scientific Research and Planning Institute for Standard and Experimental Residential and Public Building Planning] uses only three spans in this system: 5.4, 6.6 and 1.8, meaning up to a 40-percent reduction in the products mix.

A new approach is needed to evaluating the appropriateness of using certain technical resolutions. For example, the use of modular reinforced concrete bathroom units is very progressive from the viewpoint of reducing installation labor expenditures. However, it is ineffective in terms of design, since it causes an increase in the load on the between-floor slab, requiring additional expenditures of metal and concrete. Modular bathroom and kitchen load-bearing elements weighing less than 8 tons must be used in new construction. Experience in using them in construction of a Series-96K nine-story apartment building in Kiev and research done by the TsNIIEPzhilishcha have confirmed the effectiveness of this resolution. The inclusion of ventilation units in these modules further improves the economic indicators of these designs.

The catalog of industrial items must include bearing bathroom and kitchen units. At the same time, the catalog should also include a nonbearing modular bathroom unit variant with walls of nonconcrete materials and gypsum-concrete ventilation units, for possible use by small enterprises, for example, or to reflect specific local conditions.

The catalog of industrial items must possess the flexibility necessary to reflect production base specifics and actual construction conditions.

The unification of large-panel house-building into a single system will also help standardize the structural-layout resolutions of stairwell-elevator units. An experiment in building Series-83 and Series-135 apartment houses, a standardized Series-90 variant, and others confirmed the effectiveness of locating them in three-meter spacings.

The development of the All-Union Catalog of Industrial Items must become an effective means of further improving the effectiveness of fully-prefabricated housing and civil construction based on production specialization and intensification and on the possibility of cooperative provision of complete sets of components for buildings. This will also permit increasing enterprise capacity with minimal expenditures.

In conjunction with subassembly and parts standardization, consolidation of module spacing will be accompanied by a substantial reduction in the size of the products mix, which will create an opportunity to introduce building facade variants and build up cities in an architecturally fully integrated manner.

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CSO: 1821/148

CONSTRUCTION MACHINERY AND EQUIPMENT

UDC 69.002.51(031)

NEW HANDBOOK ON CONSTRUCTION MACHINES REVIEWED

Moscow MEKHANIZATSIYA STROITELSTVA in Russian No 5, May 86

[Article by candidate of technical sciences and Honored Builder of the RSFSR I. P. Barsov, under the heading "Criticism and Bibliography": "Series of Construction Machinery Handbooks"]

[Text] Stroyizdat has published 10 volumes of handbooks of about 180 author's sheets. These handbooks are unequalled in the construction literature in terms of content, size and range of topics covered. They encompass the basic groups of construction machinery: construction machinery (general portion) for earth-moving and hydraulic excavation, for pile-driving, loading and unloading, for installation and vertical transport, for finishing, hand-operated machines, technical operation of construction machinery, and machinery for transporting construction loads. The publication lacks a handbook on machinery and equipment for concreting and reinforced-concreting. These references have been published by Stroyizdat over the last several years.

An expanded range of reference data as compared with the traditional collection of information makes the handbooks especially valuable for operation workers and specialists developing POR [work organization plans], PPR [work plans] and flow charts for production processes. The inclusion of information of machine models which have passed acceptance testing, for example, and are now coming into general use should be considered a proper beginning. This information provides operation workers with a perspective on the availability of machinery for construction. Some machines (excavators, powerful bulldozers, heavy-duty cranes on pneumatic tires, machinery for drilling and casting piles in place, and so on) are obtained by construction organizations through imports, and their high cost necessitates their more intensive use, and skilled knowledge of the equipment and of its potential and its operating requirements. The technical-economic data on such equipment has been very meager in the various materials published, and it would be legitimate to include them in a fundamental series of reference works. However, there is insufficient such data in the series being reviewed here.

The construction ministries and departments produce a variety of equipment (machinery and accessories), some models of which are unique and are not produced by the machinebuilding industry. There is an especially wide variety of machinery for working frozen ground; tower, crawler and travelling gantry cranes; freight and passenger elevators; concrete pump trucks, ready-mix delivery trucks,

and other specialized motor transport equipment. One would like to have seen the handbooks include the most commonly used and efficient models of equipment produced by the construction organizations, as was done in "Mashiny dlya montazhnykh rabot i vertikalnogo transport" [Machinery for Installation and Vertical Transport] and "Mashiny dlya transportirovaniya stroitelnykh gruzov" [Machinery for Transporting Construction Freight]. As was noted above, the information on the net cost of machinery operation is useful. However, several of the handbooks ("Mashiny dlya svaynykh rabot" [Pile-Driving Machinery], "Mashiny dlya gidromekhanizatsii zemlyanykh rabor" [Hydraulic Excavation Machinery] and "Ruchnyye mashiny" [Hand-Operated Machinery]) lack such data. The descriptions of assembly components (cables, electric motors, internal combustion engines, and electrical- and hydraulic-equipment elements) will be very useful to line machinists, mechanics and maintenance personnel in making repairs, ordering spare parts, and so on. At the same time, these data are not in all the handbooks. This disrupts the harmony of their structure and requires one to do additional searching in other sources. One would like to see certain duplicated data in the general part and in individual volumes eliminated. There are repetitions of GOST's [all-union state standards], information on motors, hydraulic equipment, operating conditions and base models (of tractors, automobiles, prime movers). It would be appropriate to include in the general part a brief examination of the definition of economic effectiveness of introducing machines into construction, the availability of machinery to construction, the availability of power to labor, and machinery materials intensiveness and to cite the statute on evaluating their technical level. Not all the handbooks in this publication include energy expenditures, and where they are available, there is no indication of whether they are an established norm, manufacturing-plant data, or actual expenditures. Given that the series includes "Tekhnicheskaya ekspluatatsiya stroitelnykh mashin" [Technical Operation of Construction Machinery], it should have been possible to eliminate from the individual handbooks the sections on technical servicing and repair, including frequency and labor intensiveness.

The different sizes of printings of the individual volumes is fully justified, as this must be determined by the proportion of the given types of work in construction production, the number of machines being produced in the individual groups, and the requirements of construction organizations for them.

Given the current development of scientific-technical progress, there is a real demand for reducing the time involved in preparing and issuing individual references on construction machinery and the series as a whole to three years.

On the whole, the series of construction machinery reference handbooks reviewed here merits a positive evaluation and, with consideration of the comments here, release of a third edition as quickly as possible.

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CONSTRUCTION MACHINERY AND EQUIPMENT

SYNOPSIS OF ARTICLES IN MEKHANIZATSIYA STROITELSTVA, MAY 1986

Moscow MEKHANIZATSIYA STROITELSTVA in Russian No 5, May 86 p 31

UDC 69.007.2:658.386.1

IMPROVING MACHINE-OPERATOR TRAINING

[Synopsis of article by V. V. Kolesnichenko, pp 6-8]

[Text] Article contains recommendations on improving the training of machine operators for construction in line with the vocational school reform and in accordance with the requirements of scientific-technical progress. Focuses on the role of base enterprises in improving machine-operator training.

UDC 69.002.51.004.67

PROPER NATURE OF UNIONWIDE CONSTRUCTION EQUIPMENT MAINTENANCE SYSTEM

[Synopsis of article by N. F. Bekker and V. G. Koshekarovskiy, pp 8-11]

[Text] Proposes the organization of interdepartmental territorial associations for construction machinery overhaul. Their creation is viewed as the first, base stage in setting up a unionwide construction equipment maintenance system. The next stage is the creation of company and then warranty service based on the territorial interdepartmental associations. The proposal is preceded by a brief presentation of the problem of developing the construction equipment fleet and a description of the status of repair-maintenance machinery. Major overhaul is viewed as the main type of rebuilding of fixed production assets and is seen as ensuring a high level of maintenance industrialization. The content of major overhaul must change over time, but the number of types of repairs will be reduced to one. The appropriateness of setting up a new center for directing construction production mechanization, the Goskomstroytehniki [State Committee for Construction Equipment], analogous to the Goskomselkhoztekhnika [State Selkhoztekhnika Committee] is also noted. The article's proposals are oriented towards radical improvement in and increasing industrialization of equipment maintenance.

UDC 656.135:65.012.2

COMPREHENSIVE CONSTRUCTION-INSTALLATION WORK MECHANIZATION USING NETWORK ANALYSES

[Synopsis of article by S. R. Vladimirskiy, pp 22-25]

[Text] Offers a methodology for automated calculation of the parameters of comprehensive construction mechanization based on representing it as a public service network model. Includes a program for the SM-4 computer. 5 references.

UDC 666.97.035.51.002.5

AUTOMATING ELECTROTHERMAL CONCRETE TREATMENT UNDER CONSTRUCTION CONDITIONS

[Synopsis of article by V. V. Shishkin, A. D. Myagkov and V. I. Narskikh, pp 24-25]

[Text] Gives expenditures indicators for concreting under winter conditions and ways of lowering them through comprehensive automation of heat treatment and the use of effective heating devices under construction conditions. Describes automated power equipment, automatic devices for monitoring and regulating heating conditions, portable switch gear and a cable module, [all] developed by the TsNIIOMTP [Central Scientific Research Institute for the Organization and Mechanization of and Technical Assistance to Construction].

UDC 621.873.127(47+57) (438)

COOPERATION BY SOVIET AND POLISH CRANE BUILDERS

[Synopsis of article by N. N. Andriyenko, V. V. Gruzdev, P. V. Pankrashkin and G. N. Nurmiyev, pp 26-28]

[Text] Under a Soviet-Polish agreement, Warsaw and Odessa crane builders have developed and set up the production of a standardized series of 25-, 40-, 63- and 100-ton hydraulic cranes. The work is continuing by monitoring series production of the cranes in both countries. A number of author's certificates for inventions have been obtained in the course of the work. 4 illustrations.

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CONSTRUCTION METHODS AND MATERIALS

GOSSTROY DEPUTY CHAIRMAN ON LOWERING MATERIALS CONSUMPTION

Moscow PLANOVYE KHOZYAYSTVO in Russian No 5, May 86 pp 24-29

[Article by USSR Gosstroy [State Committee for Construction Affairs] Deputy Chairman D. Pankovskiy: "The Effect of Scientific and Technical Progress on Reducing Materials Consumption in Construction"; passages in capital letters appear in italics in original]

[Text] Reserves for conserving material resources * New technical solutions * Progressive technologies * Standards and resource conservation.

Reducing materials consumption in national income was posed as one of the chief tasks of the new version of the CPSU Program, adopted at the 27th Party Congress. "Scientific and technical progress," is it emphasized in the Program, "should be directed toward radical improvement in the UTILIZATION OF NATURAL RESOURCES, RAW MATERIALS, MATERIALS, FUEL AND POWER at all stages--from the production and comprehensive refining of raw material to the output and utilization of end products... Resource conservation will become a key source for satisfying the requirements of the national economy for fuel, power, raw materials and stocks..." (Footnote 1) (Program of the Communist Party of the Soviet Union: New Version. Adopted by the 27th CPSU Congress. Moscow: POLITIZDAT, 1986. pp 27-28)

A large role in the resolution of this problem belongs to capital construction, which annually requires approximately 30 million tons of rolled ferrous metal and steel pipe, more than 100 million tons of cement, over 50 million cubic meters of wood products and woodworking materials, 120 million square meters of structural glass, more than 3 billion pieces of standard asbestos-sheet slabs and approximately 60 million square meters of soft roofing materials. The cost of material resources in the total amount of expenditures on construction and installation work exceeds 50 percent and totals roughly 50 billion rubles a year. A one-percent saving in this sphere of the national economy per year reduces productive expenditures by 500 million rubles, ensures the theoretical freeing up of 100,000 workers and makes it possible to refrain from increasing capacity for the production of materials, articles and structural elements with capital requirements of more than 1 billion rubles.

The Fundamental Areas of Economic and Social Development of the USSR for 1986-90 and for the Period to the Year 2000 envisage a reduction of the theoretical consumption of rolled ferrous metal in construction of 14-16 percent, cement of 10-12 percent and wood products of 12-14 percent in 1990 compared to 1985, which will require intensive work by all participants in the construction process.

One of the most important areas for reducing materials consumption in construction is improving its organization and technology. According to estimates of USSR Gosstroy, the proportionate consumption of materials through these factors can be reduced to 30 percent of the total target for economizing. The chief reserve for economizing is a reduction in materials consumption in planned production using progressive standards of technological planning and utilizing modern equipment and economical spatial planning that reduces the dimensions of buildings and the loads on structural elements.

In 1981-85 USSR Gosstroy, in conjunction with the construction ministries, developed and placed in effect CONSTRUCTION NORMS, rules and STATE STANDARDS that facilitate the incorporation of the achievements of science and technology, the conservation of material and fuel-and-power resources and an improvement of the quality of construction output. The state standards are discussed in more detail below.

Much attention is devoted to scientific research work in the area of concrete and reinforced concrete, for the production of which approximately 13 million tons of steel, 90 million tons of concrete and more than 260 million cubic meters of heavy and 25 million cubic meters of light natural and artificial fillers are consumed each year. Scientific research work in this area is directed toward the creation of concretes and reinforcements that provide for a reduction in materials consumption and a sharp increase in their operating properties. The proportion of the application of low-alloy and thermally strengthened reinforcements of increased strength increased from 43 percent in 1975 to 48 percent in 1985, and that of high-strength from 3 percent to 7.5 percent respectively. Through improving the demand pattern for efficient reinforcing steel, as well as design solutions that take into account modern methods of calculating and optimizing the sections of reinforced concrete, it is possible to reduce steel consumption per cubic meter of reinforced concrete from 69 kilograms [kg] in 1985 to 61.5 kg by the year 2000.

An integral element in the manufacture of concrete and reinforced concrete is chemical admixtures and super-plasticizers. Domestic super-plasticizers have currently been created and their production organized. A number of chemical admixtures have also been obtained from industrial by-products, which permits the controlling of the process parameters of concrete and the regulation of its most important features. By the end of the 20th century, the output of concrete using super-plasticizers and chemical admixtures will reach 60-80 million cubic meters. This will produce a saving of 2-2.5 million tons of cement and will increase the durability of reinforced-concrete structural elements.

The incorporation of slag-dust by-products of TESs [thermal-electric power plants] and metallic slag for producing light and heavy concretes is being

expanded. The utilization of slag-dust by-products in the current five-year plan is increasing to 20 million tons, which will permit the additional manufacture of approximately 65 million cubic meters of concrete.

In 1981-85, a body of research was conducted on the development of a theory of calculating mass-application structural elements. The existing and the developed new norms for the planning of steel, wooden, stone and asbestos-cement structural elements and those for construction in seismic regions etc. were reviewed using the results obtained. The new norms for planning "Loads and Effects" will ensure an annual economic saving of roughly 20 million rubles and the conservation of more than 90,000 tons of steel, and the planning norms--25 million rubles and 22,000 tons respectively.

Technical solutions for new metallic structural elements for production buildings have been developed in the current five-year plan which permit a reduction in labor intensity in their manufacture and in the consumption of rolled metal. Among them are membrane structural elements utilizing thin-sheet steel for the long-span roofs of buildings and structures, structural framing elements of rolled castellated I-beams and I-beams with variable stiffness. The structural members of roofs from rolled shapes, steel silos from rolled sheet steel, crane girders on pins under the crane for heavy operating modes that possess greater reliability than welded beams have been improved.

Research is being conducted on the application of thermally hardened rolled metal in place of low-alloy steel in structural members. The development of the organization and utilization in construction of new low-alloy steel with improved features that increase the reliability and load-bearing capacity of structural elements is being implemented.

Research has been completed on the creation of a number of progressive processes in foundation building that substantially reduce the consumption of materials at the zero cycle. The method of building foundations in tamped excavations also permits the packing of the soil foundation, as a result of which the foundation can bear increased loads. A method of packing foundations that are made of loess soil and have been blast washed has undergone industrial processing. It completely eliminates the subsidence features of building and structure foundations, increases their operational reliability, and reduces the cost of foundations by 2-3 times through the elimination of piles and anti-subsidence measures.

In the 12th Five-Year Plan, the industrial production and broad incorporation of light canopy structures with steel, aluminum and wooden frameworks that are quickly erected and mobile will be begun in various sectors of the national economy. The continuation of research directed toward improving the methods of designing steel structural elements and more fully estimating the actual conditions of their operation is envisaged. It is projected to improve methods of designing buildings and structures with a regard for optimizing the parameters of structural elements and approximating the design plans to operating conditions. The opportunity will be created for applying a unified approach to the designation of the coverage of rated loads and rated materials

resistance in the design according to maximum states. The development of methods of evaluating the degree of reliability of structural elements taking into account accumulated damage is proposed.

As a result of this research, the methods of designing structures with the aim of their further simplification and the broad utilization of machine methods will be improved, and methods will also be developed for setting norms for equally reliable load-bearing structural members, which will permit the revealing of reserves and the creation of the optimal margin of safety.

Theoretical and experimental research will be conducted on discovering the most economical and reliable structural elements for seismic-resistant buildings and structures for mass construction. Design solutions have been developed and incorporated that are based on the comprehensive utilization of the systems of seismic protection and providing for the increased reliability of buildings and structures with a reduction in their materials consumption.

With the aim of reducing materials consumption in foundation building, the institutes of USSR Gosstroy are continuing research on the creation of economical structural elements and efficient processes for the construction of the footings and foundations of buildings and structures. In particular, the "waste-free process" for the construction of pile foundations proposed by DalNIIS [Far East Scientific Research Institute of Construction] will be worked out, in which the remaining non-driven and uncut piles after the subsequent splicing are used repeatedly as one of the elements of the sectional piles. In order to incorporate this process, the institutes of USSR Gosstroy, in conjunction with VNIIstroydormash [All-Union Scientific Research Institute of Construction and Road Machinery] is creating mobile equipment for the automatic installation, driving and cutting of piles.

Foundation structural elements that are manufactured from soil-cement with drilling-fluid technology using foundation soil as a structural material will be widely applied. An installation for the manufacture of foundation supports by this method has already been created, and its plant testing will be completed in 1986.

The assimilation of "regulated foundations" for construction on subsidence soils and territories being reworked has good prospects. Attachments are incorporated in their design that permit efficient operational correction of tilts that arise, which considerably relieves foundations. Testing in several residential structures has shown that they are ten times more efficient than pile foundations.

State standards play an important role in the conservation of material resources. A fixed system of standardization for construction output has taken shape today. On 1 Jan 86 there were more than 800 state standards and 35 CEMA standards in effect in the sector. Approximately 95 percent of all cement, 89 percent of asbestos-cement articles, 97 percent of structural glass, 93 percent of insulation materials, 91 percent of kermazit articles and practically all of the principal types of wall and non-metallic materials, porous fillers, sanitary and technical equipment and joinery are manufactured according to them.

The state standards approved by USSR Gosstroy provide for an annual economic saving of a total of 50-60 million rubles from the conservation of metal, cement and thermal power. The incorporation of a standard regulating the rules for monitoring the strength of concrete by achieving a high degree of homogeneity in its composition, for example, makes it possible to save 18 kg of cement per cubic meter of concrete. Elaborating the procedure for designating the tempered strength of concrete in the manufacture of structural elements and articles and the establishment of standard tempered strength of no more than 90 percent by class or brand of concrete (in place of the 100 percent adopted earlier) facilitates the conservation of up to 1 million tons of cement a year. The application of cement-chip slabs as facings in place of laminated plywood will make it possible to conserve 10 cubic meters of industrial wood per 1,000 square meters of facing surface.

The NII [Scientific Research Institute] of Construction Physics, in conjunction with other construction and instrument-building institutes, has developed the first group of state standards that provide for the creation and incorporation of efficient methods and equipment for monitoring thermal technical indicators and the economical utilization of fuel and power resources. State standards have been developed and placed in effect for methods of determining the resistance of surrounding structural elements to air and steam penetration, heat transfer, determining moisture absorption and thermal stability, and the televised monitoring of the quality of thermal protection of building structural elements. An economic saving from the incorporation of these standards is being achieved through the possible reduction of heat loss by 20-30 percent and conservation in the heating of buildings of no less than 1 million tons of standard fuel.

A substantial reserve for reducing materials consumption in construction is the further improvement of planning and, in particular, standard planning documentation. The achievement of an even inconsiderable reduction of materials consumption in the development of standardized structural elements, articles, assemblies and standard building plans provides a saving of resources through their large-scale series production and repeated application.

USSR Gosstroy assigns very great significance to the analysis of the materials-consumption indicators actually achieved in standardized plans. The results of this analysis testify to an increase in the technical and economic level of a considerable portion of the newly developed standardized plans. Rational configuration, spatial-planning, design and technological solutions in the plans and the application of efficient standardized structural elements provided for the achievement of higher technical, economic and operational indicators.

One of the chief factors facilitating the conservation and rational consumption of basic construction materials is a high technical and economic level and the optimal nature of planning solutions for buildings and structures. It is for precisely this reason that USSR Gosstroy devotes great attention to monitoring the quality of planning at the planning organizations of ministries and departments. In audits, spatial-planning and design solutions are evaluated along with the correctness of the standardized

structural elements and articles used, the load designations and other quality indicators; appropriate recommendations for reducing the consumption of material, fuel, power and labor resources in the plans are worked out and sent to the ministries.

In the 11th Five-Year Plan, Gosgrazhdanstroy [State Committee for Civil Construction and Architecture] and its subordinate institutes incorporated progressive technical solutions into the planning of mass residential and public buildings that provide for a reduction in material, fuel and power resources. In 1981-83, all blueprints for standardized reinforced-concrete structural elements were corrected with regard to increasing the rated resistances of steel reinforcements and the introduction of safety factors for structural elements and the changes incorporated into norm documentation. The standardized plans developed for fully prefabricated residential housing will contain technical solutions that are directed toward reducing metal consumption and increasing the level of thermal protection of the buildings. These solutions envisage economical foundations, floors boards calibrated according to the height, industrial floor structural elements and progressive finishing materials that eliminate wet processes.

A further reduction in fuel consumption and increase in the level of thermal protection for residential housing and public buildings will be achieved through the broad incorporation of three-layer panels for exterior walls of flexible and rigid braces with efficient insulation of expanded polystyrene. Compared to single-layer wall paneling made of kermazit concrete, these panels permit an annual saving of 10-12 kg of standard fuel per square meter of wall.

In 1982-84, large-panel (series 1.090) and frame-panel (series 1.020) standardized structural elements for interspecific applications in the construction of public and auxiliary buildings for industrial enterprises under usual conditions, in seismic regions and in territories with subsidence soils and mine workings were developed. The transfer of the construction-industry base to the manufacture of series 1.020 frame-panel structural elements for interspecific applications that ensure a reduction in steel consumption of up to 15 percent (by 4-5 kg per square meter of total area) compared to the II-04 series and its modifications, will permit a saving of up to 45-48,000 tons of metal in 1990.

It was noted in the report of USSR Council of Ministers Chairman N. I. Ryzhkov at the 27th Party Congress that the realization of the investment program of the five-year plan requires an increase in the level of industrialization of capital construction, the material and technical base of which should be based on the latest achievements of domestic and foreign science and technology.

Measures are projected in the 12th Five-Year Plan for the development of industrial monolithic residential construction and the strengthening of its base. The experience of the Lithuanian, Moldavian and Belorussian SSRs and a number of oblasts in the RSFSR showed that expenditures for the creation of its productive base are 30-40 percent less than large-panel residential construction. Monolithic homes have a higher level of thermal protection.

Large reserves for reducing labor expenditures and materials consumption can be obtained with the incorporation of the new design system with the stressing the steel under construction conditions (based on Yugoslavian construction experience).

Improving the construction process plays an important role in reducing materials consumption. Over the last 3 years alone, the amount of concrete placements of monolithic and prefabricated-monolithic structural elements with the addition of concrete mix by automated concrete trucks and concrete-pump feed grew from 2.8 million cubic meters to 4.507 million cubic meters, that is, by 1.6 times. As a result, 10 tons of cement were saved for every thousand cubic meters of concrete poured. The construction sites of USSR Minenergo [Ministry of Power and Electrification]--53,200 tons--and USSR Mintyazhstroy [Ministry of Construction of Heavy Industry Enterprises]--31,400 tons--achieved the largest saving of cement through the application of mechanized concrete operations in the last five-year plan.

At the same time, with comparatively equal fronts for the possible application of comprehensive mechanization, there is still an inconsiderable share of concrete work that is fulfilled with the use of concrete trucks and concrete pumps in a number of ministries. Thus, while the mechanized pouring and delivery of mix totals 16.7 percent at the construction sites of USSR Minenergo and 14.7 percent at USSR Mintyazhstroy, it is only 3 percent at USSR Minpromstroy [Ministry of Industrial Construction] sites, 5.2 percent at those of USSR Minstroy [Ministry of Construction] and 7.3 percent at those of Mintransstroy [Ministry of Transport Construction]. As a result of this, the conservation of cement over the last five-year plan totaled just 10,500 tons at USSR Minpromstroy, 15,000 tons at USSR Minstroy and 13,000 tons at Mintransstroy.

In the 11th Five-Year Plan, the "wall-in-trench" method of erecting underground structures was widely applied, which allowed a saving of 40 tons of metal and 130 tons of cement for each thousand square meters of wall. In 1981-85, approximately 1 million square meters were erected with this method, which saved 38,400 tons of metal and 125,000 tons of cement. The largest amounts of work were fulfilled in the organizations of USSR Minenergo--24,000 square meters a year, USSR Minvodkhoz [Ministry of Land Reclamation and Water Resources]--26,000 square meters, USSR Minmontazhspetsstroy [Ministry of Installation and Special Construction Work]--37,000 square meters, and the RSFSR Council of Ministers--32,000 square meters.

It should be noted that secondary resources are still utilized insufficiently in construction, although their application could produce a considerable economy of materials, and first and foremost of cement. Thus, 1 ton of granulated slag in the production of Portland blast-furnace cement replaces roughly 0.6 tons of cement clinker, and 1 ton of dry ash economizes up to 30 percent of the cement in the manufacture of concrete mixes.

In a system of measures that ensures a reduction in materials consumption, improving the norm setting for the consumption of materials, and first and foremost the norm per 1 million rubles of the estimated cost of construction and installation work, according to which is determined the requirement for

material resources in capital construction in the formulation of yearly plans of economic and social development of the USSR, has great significance. In 1981-85, USSR Gosstroy reviewed, and in conjunction with USSR Gosplan approved, norms for the consumption of materials per 1 million rubles of the estimated cost of construction and installation work for the new construction of production-use facilities. These norms are 6.1 percent lower on average for metal, 6.8 percent for cement and 9 percent for wood products than those in effect earlier.

The 27th CPSU Congress places great and complex tasks before capital construction. The amount of contractor work over the five-year plan is growing by 15-16 percent. Such a considerable increase should be achieved in practice without additional resources, chiefly through the economizing of basic construction materials. The reduction of materials consumption in construction based on the achievements of scientific and technical progress is therefore a crucial task for construction workers.

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